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ELECTRONIC AND TELECOMMUNICATION ACTIVITIES IN EGYPT

DAVID K. CHENG

14 December 1976

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This report summarizes the existing and planned activities in the field of electronics and telecommunications in Egypt. Activities in the research, industry, and service sectors are described separately and some proposed future plans are given. A description of a planned Pan-Arab space-satellite network is also included.

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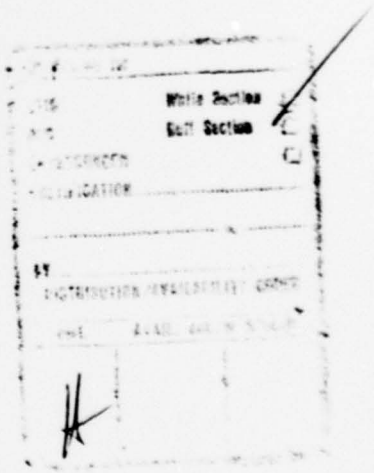

I. Introduction

Compared with the norms of developed countries, the existing telecommunication facilities in Egypt are quite meager. However, there are indications that the Egyptian government now realizes the importance of telecommunications to national security and economic development and has drawn plans to improve these facilities. Recently I had an opportunity to visit and talk with Dr. M.A. El-Said, Chairman of Egypt's Telecommunication Research Center in Cairo. El-Said, who is concurrently a Professor in the Electronic and Telecommunication Engineering Department at the University of Cairo., supplied me with some very recent data on the existing and planned activities in the field of electronics and telecommunications in Egypt. This is a report largly based on these data.

Activities in electronics and t lecommunications in Egypt exist in three sectors: research, industry, and service. These will be described separately below. Both the Telecommunication Research Center (TRC) and the Arab Republic of Egypt Telecommunication Organization (ARETO) have ambitious development plans. Some of their more important future projects will be related. A description of the requirements and constraints of a planned Pan-Arab space-satellite network is also included.

II. Activities in the Research Sector

The Research Sector in Egypt consists of universities, an Academy of Science and Technology, and four applied research centers. Their functions and current activities are as follows:

A. Universities

Egypt has five principal universities: Cairo University, Ein-Shams University and Al-Azhar University, all in the Greater Cairo region; Alexandria University in the north; and Assuit University in the south. In addition, five other universities have been established recently in various other regions. The Egyptian educational system specifies a five-year BSc engineering course at a university which follows a 12-year primary and secondary school education. The universities graduate annually about 700 engineers in electronics and telecommunications. Nominally all find employment: in practice, the government simply assigns each agency a certain number of new graduates whether or not they are needed there.

The universities also offer postgraduate work leading to MSc and PhD degrees. The MSc degree normally consists of a year's course

work followed by a year's research leading to a thesis. The PhD degree is granted on the basis of research only, which takes a minimum of two years beyond the MSc degree. In electronics and telecommunications the students partic pate in applied research problems, some of which are supported by government agencies.

B. Academy of Science and Technology

In 1971 Egypt established an Academy of Science and Technology to foster scientific research and to encourage the application of modern technology to industrial development. Under the Academy there are various councils, each concerned with a specialized sector of science. The Council on Applied Electronics now supports research work at universities and applied research centers on the following topics:

- Electrochemical conversion and storage of solar energy
- Geophysical prospecting by electromagnetic waves
- Survey of electromagnetic interfering signals in the Greater Cairo area
- Wave propagation characteristics in Arab countries
- Microelectronics
- Laser applications
- Digital techniques
- Engineering applications of computers
- Computer simulation of traffic problems
- Applications of microwave power

C. Applied Research Centers

Four applied research centers in electronics and telecommunications have been established:

(1) Telecommunications Research Center (TRC)

This is the organization which El-Said heads. It was established in 1973 to assist and advise the government on the improvement and development of the Egyptian telecommunication network and electronic industry. At present, the TRC has four divisions: admisistrative, training, projects,

and research and development. The Projects Division sponsors contracts at various universities. The projects include transmission through optical fibers, digital communication techniques, computer applications in telephone exchanges, and subscriber networks. The research and development division currently studies problems in carrier systems, microwave links, integrated circuits, cable protection, optical communications, etc. The total number of technical personnel at the TRC is about 50.

(2) National Research Center (NRC)

The NRC is a unit of the Academy of Science and Technology. Its electronics group now employs about 12 MSc's and 15 PhD's studying problems in three areas.

a. Microwaves - Terrestial and satellite communication links, broadband comunication systems for high data-rates, and navigation systems.
b. Computers - Hardware and software for computer application in industrial process control, signal processing, hybrid computation, micro-computers and microprocessors, dynamic system simulations, and computer analysis of power networks.
c. Power electronics - power system control, SCR techniques, etc.

(3) Industrial R&D Center (IRDC)

The IRDC belongs to the Ministry of Industry. It currently employs about 30 engineers in the R&D of transceivers, measuring instruments, TV and radio receivers, and new materials.

(4) Electronics Research Center (ERC)

The ERC is a unit of the Egyptian Engineering TV and Broadcasting Organization. Its 25 engineers are studying the correlation between the measured microwave propagation characteristics and the characteristics predicted from surface meteorological readings, UHF transceivers, antennas, microwave components, and new materials.

III. Activities in the Industry Sector

The electronics industry in Egypt probably began in 1956 when the country started to assemble large numbers of radio receivers from components. Assembly of TV sets started in 1961 and, in 1969, the Katron Factory in Banha was established to make both components and TV sets. This company now also makes radio receivers and other electronic equipment.

A factory was established in 1963 to manufacture telephone sets and exchange equipment. Its facilities were later expanded as a cooperative venture with L.M. Ericsson Co. of Sweden to produce also cross-bar switches. Other companies of electronic products have come into being, among which the Arabic Company and the El-Nasr Company are the more prominent.

The Arabic Company makes transistors, radio receivers and TV sets. The El-Nasr Company, established in 1970, is one of the largest producers of television and electronic equipment in Egypt. It has 13 factories, a research laboratory, and 42 service centers spread all over the country. It currently employs about 3200 people, and its products include audio systems, casettes, hearing aids, cathode-ray tubes, and other communication equipment. Contractual arrangements for the importation of technical know-how exist with Japan's Sanyo and National, and with US's RCA.

IV. Activities in the Service Sector

Several organizations in Egypt are engaged in providing telecommunication services. The two most important ones are the Arab Republic of Egypt Telecommunications Organization (ARETO) and the Television and Broadcasting Engineering Organization (TBEO).

A. ARETO

The ARETO, an autonomous unit under the Ministry of Transport and Telecommunications, is responsible for the national and international telephone, telegraph, and telex services. At present there are submarine cables between Alexandria and Catanzaro (Italy) with a capacity of 480 telephone circuits and between Alexandria and Beyrouth (Lebanon) with 120 telephone circuits. Coaxial-cable networks exist in the Delta and Red Sea zones and a cable system covering the Upper Egypt (Cairo-Aswan) zone is under construction. Overhead carrier lines inter-connect the main cities, but they usually provide only 12 telephone channels. The present telex capacity at the Cairo exchange is 400 lines and at the Alexandria exchange, 200 lines. The international telex exchange in Cairo has 132 international circuits.

Several microwave links for radio communication are in operation in the country. They are:

(1) Cairo to Libyan border - Japanese equipment, 960 channels;
(2) Between Cairo and Alexandria - French equipment, 300 channels and TV broadcast;

(3) Between Mansoura and Port Said - Italian equipment, 960 channels;
(4) Troposcatter link between Aswan and Wadi-Halfa (Sudan) - US and British equipment using 1-kW output at 800-900 MHz with 60-ft antennas to provide 24 telephone and 24 telegraph and telex circuits.

The ARETO has an ambitious 5-year plan to increase Egypt's domestic and international telecommunications capacity by many folds. This will be discussed in Section V.

Radio broadcasting in Egypt was started in 1934 by the Marconi Company which handed over its operations to the Egyptian Broadcasting Oragnization in 1947. There are now 21 medium-wave broadcasting stations with a total power of 3 MW. Since the largest station has a 1-MW output, the other stations all have relatively low power ratings. There are also 16 shortwave stations with a combined output in the range of 2 MW.

Television was introduced in 1960. The existing TV network includes a two-way transmission circuit between Cairo and Alexandria and a one-way transmission from Cairo to Aswan. Color TV is still in an experimental stage.

V. Proposed Future Plans

During my recent visit I was briefed on the future plans to improve Egypt's electronic capabilities and telecommunication services. Much of the planned activities is likely to develop from the TRC [p. 2, Section II-C(1)] and the ARETO (p. 4, Section IV-A). These will be discussed below.

A. Five-Year Plan for TRC

As previously indicated on p. 2, the TRC currently employs about 50 technical people. This number is to be increased to 297 engineers and 57 technicians in five years, of whom 187 engineers and 39 technicians will be engaged in research, development and design, and the rest in technoeconomic projects and training. I was shown an ambitious projected organization chart which lists a total of 616 people, including 129 administrative and clerical employees and 133 laborers. The high percentage of laborers is perhaps difficult to understand for those who have never visited Egypt. However, having been in that country, I was not very surprised to see from the planning data that 71 laborers were assigned to the Research, Development and Design Division alone. It is a way of life in Egypt.

The Research, Development and Design Division is to consist of three branches, as follows:

(1) Basic Research and Development Branch
   a. Solid-state materials and devices unit
   b. Digital communication unit
   c. Optical communication unit

(2) Field Research and Development Branch - This Branch is concerned with the design and testing of wire and wireless communication equipments (sources, cables, exchanges, propagation media, transmitters, receivers, antennas, waveguides, etc.).
   a. Wire communication unit
   b. Wireless communication unit.

(3) Prototype Design and Manufacturing Branch
   a. Electronic measuring instruments unit
   b. Wire communication equimpment unit
   c. Wireless communication equipment unit

Besides the Research, Development and Design Division, TRC's organization chart for the future shows a Techno-Economic Projects Division, a Training Division, and a General Secretariat. The Techno-Economic Projects Division is to carry out feasibility studies of national and international projects and to collect scientific and technical statistics and information on communication systems and related arts. The functions of the Training Division and of the General Secretariat are self-explanatory.

B. Five-Year Plan for ARETO

The five-year plan for ARETO can be described separately in terms of its national and international services.

(1) National Services

The existing capacity of the telephone exchanges in Egypt is about 375,000 lines, of which 325,000 are automatic and 50,000 are manual. There is a waiting list for 205,000 lines (135,000 in the Cairo area alone). It is obvious that getting a telephone line installed is a herculean task requiring influence. The ARETO plan is to install 410,000 new lines in five years, 49,000 of which are to replace old ones. A fact-finding committee has been formed to assess the feasibility of introducing electronic switching to the Egyptian network. A new coaxial cable being installed between Cairo and Aswan is expected to be operative in 1977. It is also planned to establish a microwave link between these two cities as an alternative route and to install new exchanges in the Suez Canal zone.

(2) International Services

There is an existing manual telephone exchange serving international calls with a capacity of 42 positions and 100 circuits. The ARETO has contracted for the installation of a new semi-automatic

exchange with an ultimate capacity of 1000 international circuits. Also under installation now (by the Nippon Electric Company) is a standard earth station for satellite communication over the Atlantic region with 120 (extendable to 240) circuits. Submarine cables are being laid between Alexandria and Tartous (Syria) and between Safaga and Dabba (Saudi Arabia). A microwave link between Alexandria and the Libyan border is being completed for exchanging TV and broadcast programs.

Special attention is being paid to increasing the Telex capacity of the country. At present the Telex capacities at the exchanges in Cairo and Alexandria are 800 and 320 lines respectively. The total Telex capacity is to be increased to 9840 lines by 1980.

VI. Planned Pan-Arab Space-Satellite Network

A. Packground of the Program

In 1971 UNESCO after the visit of a delegation of experts to six member-states of the Arab League, issued a document, emphasing the possible benefits of a satellite communication system to Arab countries. The first Arab Conference for Space Communications, convened in Amman (Jordan), confirmed the need of such a system for communication and exchange of cultural and entertainment programs. The Arab countries are characterized by a vast area (covering about 8000 km in the east-west direction and 3500 km in the north-south direction), many thinly populated regions and a common language. It appears that an appropriate radiation pattern from a single satellite in a geostationary orbit and a system of ground receiving stations would be an ideal solution to reach most of the population. The immediate aims are to establish a telephone network throughout the whole area and to provide radio and black-and-white TV programs. The interchange of color TV programs among the member-states is a longer-range project.

B. System Requirements

The satellite is to carry three independent antenna systems: one each for an S-band (2 to 4 GHz) down-link, a C-band (4 to 8 GHz) down-link, and a C-band up-link. The antennas are to have the same elliptical main beam with half-power beamwidths of 6 and 12 degrees which will cover all the member-states of the Arab League. Fifty-watt transponders are to be used for the transmission of one black-and-white TV program and 10 radio programs in the S band to reliable unmanned ground receivers with 3-m reflector antennas. Transmission of color TV programs and long-distance telephones in the C band is to be provided by 2-W transponders. The satellite is to be compatible with the launch vehicle Thor Delta 2914 and is to have a lifetime of at least seven years. However, it is doubtful

that the satellite communication system and the network of ground stations can be operative within five years.

VII. Conclusion

In this report I have tried to give an overview of the electronic and telecommunication activities in the research, industry, and service sectors of Egypt. The existing facilities are quite meager, and their improvement depends very much upon the determination of the government. Realizing the importance of telecommunications to national security and economic development, the Egyptian government has formulated long-range plans which will expand all phases of its telecommunication capability, including an investment in a Pan-Arab space-satellite network. If all goes well, the facilities will be much augmented by 1980, although the completion date of the space-satellite network is uncertain.

Egypt is a poor country. It has not escaped the detrimental effects of inflation, and developmental plans are necessarily constrained by the nation's resources. Through the US Special Foreign Currency (PL-480) program, a cooperative research project in the electronics area has been sponsored at the University of Cairo (see ESN-30-0:403). Outside encouragements such as this are bound to have positive effects on improving Egypt's capability in electronics and telecommunications.